compartments containing homogeneous material, and (*b*) compartments which admit freely any literary matter of sufficient merit or popular appeal. The problem, therefore, is to devise a scheme by which information contained in the latter class—for class (*a*) presents no special difficulties—can be made to flow towards its proper recipient, and this, obviously, can be effected economically only by the acceptance of a common system of classification.

So far as the literature of science is concerned, a classification already exists in the scheme adopted by the "International Catalogue of Scientific Literature." This scheme has been incorporated in that of the Library of the United States Congress—a library the staff of which appears to possess special qualifications for dealing with the literature of the exact sciences. Further, this scheme has been published in two forms: (*a*) with its headings arranged in class order and issued in separate sections, *e.g.* Q=science in general [QA=mathematics, and so forth]; and (*b*) with its headings arranged in one general alphabet. Thus science possesses a classification stamped with its own hall-mark, but grafted on to a scheme for the general classification of knowledge. Still, the acceptance of the Library of Congress classification is not an essential feature of these proposals, which are based on the recognition (1) of the division of periodical literature into (*a*) the homogeneous and (*b*) the non-homogeneous classes; (2) of the economic advantage of dealing on a co-operative basis with the latter; and further, since the non-homogeneous periodicals cover all departments of knowledge, (3) of the necessity of adopting some agreed system of classification for the purpose of establishing a means of exchange between the different interests.

Thus we have shown that the core or *umbra* of a subject is comprised in a body of homogeneous literature which unquestionably can best be dealt with by its representative professional society, but that outside this core there exists a *penumbra* of relevant matter dispersed through a literature of gradually increasing irrelevance, with the result that the recovery of the relevant matter can be effected economically only by co-operative effort. The solution, therefore, would appear to be to bring into existence a Central Bureau which should deal solely with the indexing of periodicals of the non-homogeneous character—and in the first stages of its work, with a restricted list of periodicals assigned to it by the contributory bodies. These bodies would receive from the Central Bureau entries from the periodicals examined corresponding to their specified requirements. But as the professional abstracts became more fully representative of progress in their respective fields the need for the publication of the corresponding indexes would tend to disappear. The institution, therefore, of a Central Bureau would ultimately make for economy in all branches of science in which the publication of abstracts is admittedly indispensable.

So far as science is concerned, it will probably be found that the simplest and most effective method for obtaining the necessary index slips would be to invite the Central Bureau of the "International Catalogue of Scientific Literature" to provide them. Indeed, the possibility of co-operation between the "International Catalogue" and the abstracting journals was one of the subjects considered at the conference held last September. Any such arrangement would probably begin with the year 1921, and, as a preliminary, the "International Catalogue" should be brought up to date by the publication of volumes for 1915–20. The provision of funds for this purpose is an urgent necessity, as explained in NATURE for October 7, 1920, vol. cvi., p. 195.

In the foregoing observations we have assumed that the proper bibliographical equipment of the sciences will in the main be founded upon the possession of adequate abstracts. But if the subject were threshed out in an open conference at which representatives of all branches of knowledge were invited to attend, this proposition would not be accepted as holding good universally. Some branches would probably prefer periodical critical reviews or summaries of the year's progress, while others would be content with alphabetically arranged index entries. Our final proposal, therefore, is that such a conference should be held in order that the special requirements of each division of knowledge should be authoritatively ascertained, and the feasibility of co-operative or co-ordinated action discussed.

See also Sept 8 p 43

Piezo-chemistry.

Piezochemie kondensierter Systeme. By Prof. E. Cohen and Dr. W. Schut. Pp. ix+449. (Leipzig: Akademische Verlagsgesellschaft m.b.H.: Gustav Fock, 1919.)

THE direction and extent of a physical or chemical change are frequently determined or modified by pressure. This fact has long been known, and has been the subject of occasional investigation at various times, even from the earliest periods of systematic scientific inquiry. It occupied the attention of the first Italian academies, and was among the matters experimentally studied by the Fellows during the early years of the Royal Society. Until comparatively recent times, however, work on the subject was sporadic, intermittent, and directed mainly to the investigation of particular cases rather than to the elucidation of general principles. The necessities of modern chemical manufactures have created a demand for further and more accurate knowledge, inasmuch as the whole course of a chemical reaction and its economic aspect may depend upon it. Many instances of this fact might be cited. One of the most recent, and also one of the most striking, is seen in the case of the synthetic production of ammonia from its elements under the influence of catalysts, in which the question of the appropriate pressure is of fundamental importance.

Prof. Ernst Cohen, of the van't Hoff Laboratory of the University of Utrecht, and his collaborator, Dr. W. Schut, have placed chemists and physicists under a great obligation by their compilation of the book now under review. It does not profess to be a text-book on the subject. It is, as stated, a compilation of the facts known, or allowed to transpire, scattered through the volumes of some fifty different periodicals, and was originally made for the convenience of workers on the subject of piezo- (or pressure) chemistry in the laboratory which Prof. Cohen directs. The material thus accumulated has been arranged in a systematic and orderly manner. We have, first, a description of the methods of creating and measuring high pressures; next, a general discussion of compressibility, its methods, direct and indirect, with some account of their relative merits and defects. Then follows a full historical description of the several attempts to obtain accurate values of certain fiduciary constants generally necessary in piezometric work—viz. the compressibility coefficients of glass, mercury, water, and incidentally of ice, and their relation to temperature. Each section is accompanied by bibliographical references to the original sources of information.

The authors then treat of the compressibility coefficients of the various elements and such of their compounds as have been studied. Special attention is, of course, paid to the work of Richards, of Harvard, and his co-workers, and the question of the compressibility of atoms and the existence of interatomic spaces in solids and liquids is shortly discussed, mainly in the light of the American chemist's published views on the subject. As regards liquids, an attempt is made to group them in conformity with their chemical relationships. Thus all the hydrocarbons are brought together, as are the alcohols, esters, halogen compounds, acids, etc., obviously with the view of facilitating the detection of general principles. It must be confessed, however, that as yet the data afforded by different investigators are too discrepant to afford a satisfactory basis for generalisations. This is due mainly to imperfections in the method of observation, and in a less degree in some cases to insufficient care in the purification of the liquids employed. Accurate work, like that of Bridgman, suffers by association with that of earlier inquirers whose measurements were largely of the pioneering order.

Although definite numerical values are lacking in many cases, certain conclusions may be said to be fairly well established. Thus, for example, Bartoli has shown that the compressibility-coefficient in an homologous series of the liquid paraffins decreases with the increase of molecular weight. That the same is true of the aromatic hydrocarbons appears from the observations of Richards and his co-workers. Measured at equal temperatures and pressures, benzol is more compressible than toluol, and toluol than xylol. The various isomerides of xylol have, however, different compressibilities, *o*-xylol being less compressible than *m*-xylol, which in its turn is more compressible than *p*-xylol, and still less compressible than ethyl-benzol. Identical thermometric temperatures, strictly speaking, are not absolute evidence of a comparable physical condition. Before any sound deductions can be made it will be necessary to establish what is a valid comparable condition. There is a considerable volume of work on the compressibility of liquids, but its treatment and discussion are vitiated by the circumstance that this point has hitherto been insufficiently appreciated. For a fuller account of the relation of compressibility to the chemical nature and constitution of liquids, Prof. Cohen's volume must be consulted.

The influence of pressure upon the expansion-coefficients of substances—solids, liquids, solutions, and alloys—and upon surface tension and melting-point has been studied by many observers. Their work has been systematically collated by the authors, and its outcome discussed. The case of water is of special interest, on account of the abnormality it displays in so many particulars. It is well known that the temperature of maximum density of water is lowered by pressure, a fact which was established by Tait in 1883, and, later, by Amagat, and confirmed on theoretical grounds by van der Waals and Puschl. Each increment of 1 atmosphere pressure lowers the temperature of maximum density by 0·0217° C. The influence of pressure on the melting-point of ice is equally well known, and has been frequently studied since it was first pointed out by James Thomson and his brother, Lord Kelvin, in 1849, and its natural effect traced by Faraday and Tyndall in the phenomenon of regelation and the movement of glaciers. The large body of evidence on the relation of pressure to melting-point has been carefully collected and displayed in tabular form. For its discussion we must refer to the work itself.

A considerable section of the work is devoted to a consideration of the influence of pressure upon the flow and permanent increase of density of solid substances, and upon the viscosity of liquids. As regards water, the viscosity diminishes with increasing pressure up to 900 atmospheres, between 0° and 32° C., when it attains a minimum. Above this temperature it increases by pressure; below it it decreases in proportion to the increase of pressure. All the phenomena of the compressibility of water serve to confirm the general belief that it is an associated liquid —*i.e.* its molecular complexity under ordinary natural conditions is not properly represented by the simple formula H_2O.

Space will not permit of more than the briefest possible reference to the remaining sections of this valuable work. These treat of the influence of pressure on the electric conductivity of solutions and solids; on the thermo-electric properties of metals; on dielectric constants; on the validity of Faraday's first law; on solubility, diffusion, refractive index, and polarimetry.

It will be seen from this account that the work is mainly concerned with the influence of pressure upon the physical properties of substances, and to that extent its title is rather a misnomer. It might, perhaps, be more fittingly styled piezophysics. However, the border-line between physics and chemistry is becoming more and more ill-defined, for the spheres of the two sciences gradually merge into each other. There is some point in the good-natured gibe that chemistry, after all, is only the dirty part of physics. We may, however, express the hope that the authors will add to our obligation by extending their work so as to include the influence of pressure upon chemical change. There is now a fairly abundant literature upon the subject, but it requires to be collected, annotated, and digested, and its general principles elucidated.

T. E. THORPE.

Social Degeneration.

(1) *Social Decay and Regeneration.* By R. Austin Freeman. With an introduction by Havelock Ellis. Pp. xx + 345. (London: Constable and Co., Ltd., 1921.) 18*s.*

(2) *The History of Social Development.* By Dr. F. Müller-Lyer. Translated by Elizabeth Coote Lake and H. A. Lake. With an introduction by Prof. L. T. Hobhouse and Prof. E. J. Urwick. (Studies in Economics and Political Science.) Pp. 362. (London: George Allen and Unwin, Ltd., 1920.) 18*s.* net.

(1) SAMUEL BUTLER tells us that the Erewhonians destroyed all their machines and lived happily ever after. An Erewhonian financier pointed to the "magnificent ruins of the railway-station" as an object of interest in his park. Mr. Austin Freeman, in all seriousness, agrees with the Erewhonians. His book is a searching indictment of the machine as the cause of our present discontents.

> Ill fares the land, to hastening ills a prey,
> Where wealth accumulates and men decay.

The decay wrought by machinery is not numerical; it is something much worse. The ultimate factor of national decline is racial deterioration; and in modern societies this is very extensive and pernicious. Unfavourable variations are not eliminated, and there is a reversed natural selection in favour of the unfit. The essential character of modern civilisation is a war of mechanism on man.

"Mechanism has destroyed industry and replaced it by mere labour; it has degraded and vulgarised the works of man; it has destroyed social unity and replaced it by social disintegration and class antagonism to an extent which directly threatens civilisation; it has injuriously affected the structural type of society by developing its organisation at the expense of the individual; it has endowed the inferior man with political power which he employs to the common disadvantage by creating political institutions of a socially destructive type; and finally, by its reactions on the activities of war, it constitutes an agent for the wholesale physical destruction of man and his works and the extinction of human culture. It is thus strictly analogous to those anti-bodies by